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Chang

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(54) **SYSTEM AND METHOD FOR IDENTIFYING TELEPHONE CALLERS**

(75) Inventor: **Hisao M. Chang**, Austin, TX (US)

(73) Assignee: **AT&T Intellectual Property I, L.P.**, Reno, NV (US)

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(52) **U.S. Cl.** **379/88.02**; 370/352; 370/353; 370/354; 370/355; 370/356; 379/88.01; 379/142.05; 379/142.06; 379/211.01; 379/212.01; 379/213.01; 379/214.01; 379/265.02; 455/415; 455/417; 704/270; 704/270.1; 709/202

(58) **Field of Classification Search** 370/351–356; 379/88.01–88.02, 142.05–142.06, 211.01, 379/212.01, 213.01, 214.01, 265.02; 455/415, 455/417; 709/202; 704/270–270.1
See application file for complete search history.

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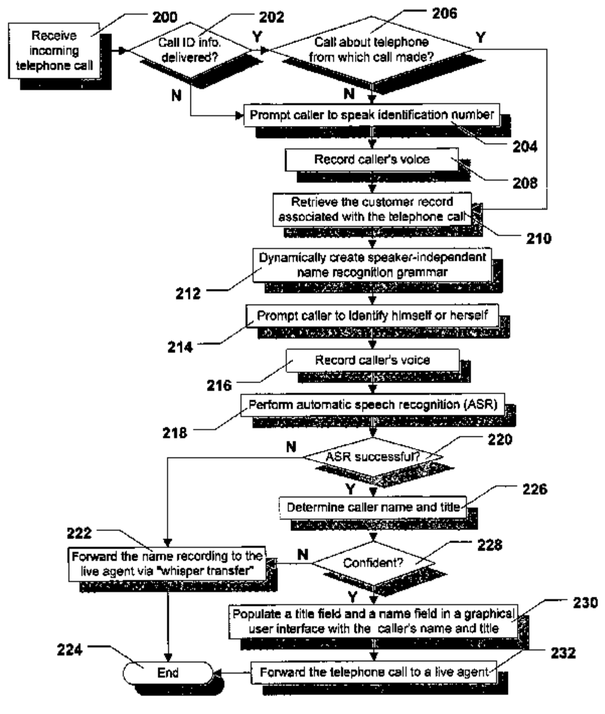
Primary Examiner—Hemant Patel
(74) *Attorney, Agent, or Firm*—Toler Law Group

(57) **ABSTRACT**

A method of processing calls received at an interactive voice response (IVR) server is provided and includes receiving a telephone call at the IVR. Caller identity data that is associated with the telephone call is received and a customer profile that includes a list of individual names associated with the caller identity data is received. Each of the individual names is mapped to a speech recognition grammar pattern. Further, a caller of the telephone call is prompted to speak their name. A spoken name from the caller is received and recorded. Moreover, the spoken name is converted into a speech recognition grammar pattern. Thereafter, the speech recognition grammar pattern associated with the spoken name is compared to each of the speech recognition grammar patterns associated with the individual names retrieved from the customer profile.

21 Claims, 3 Drawing Sheets



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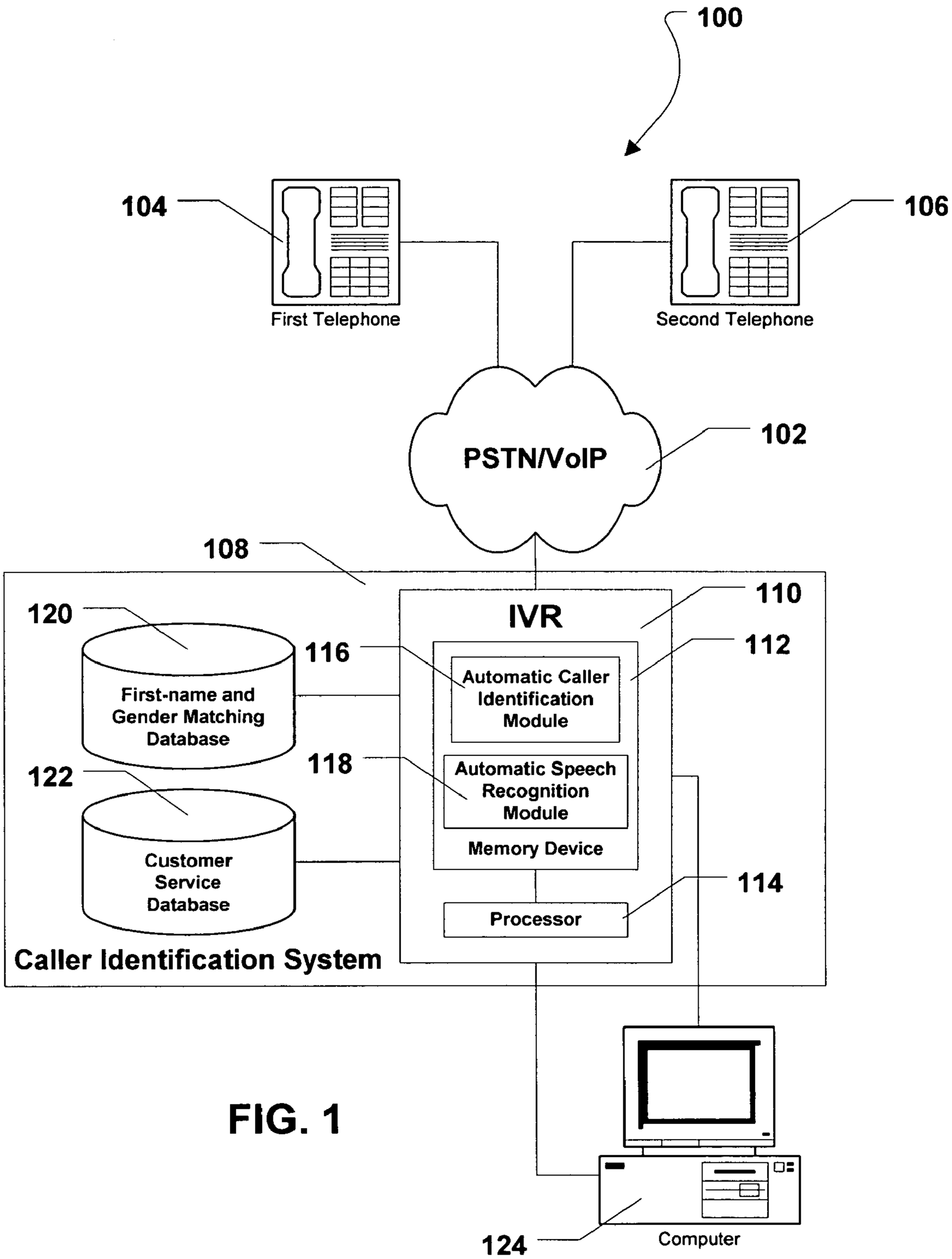
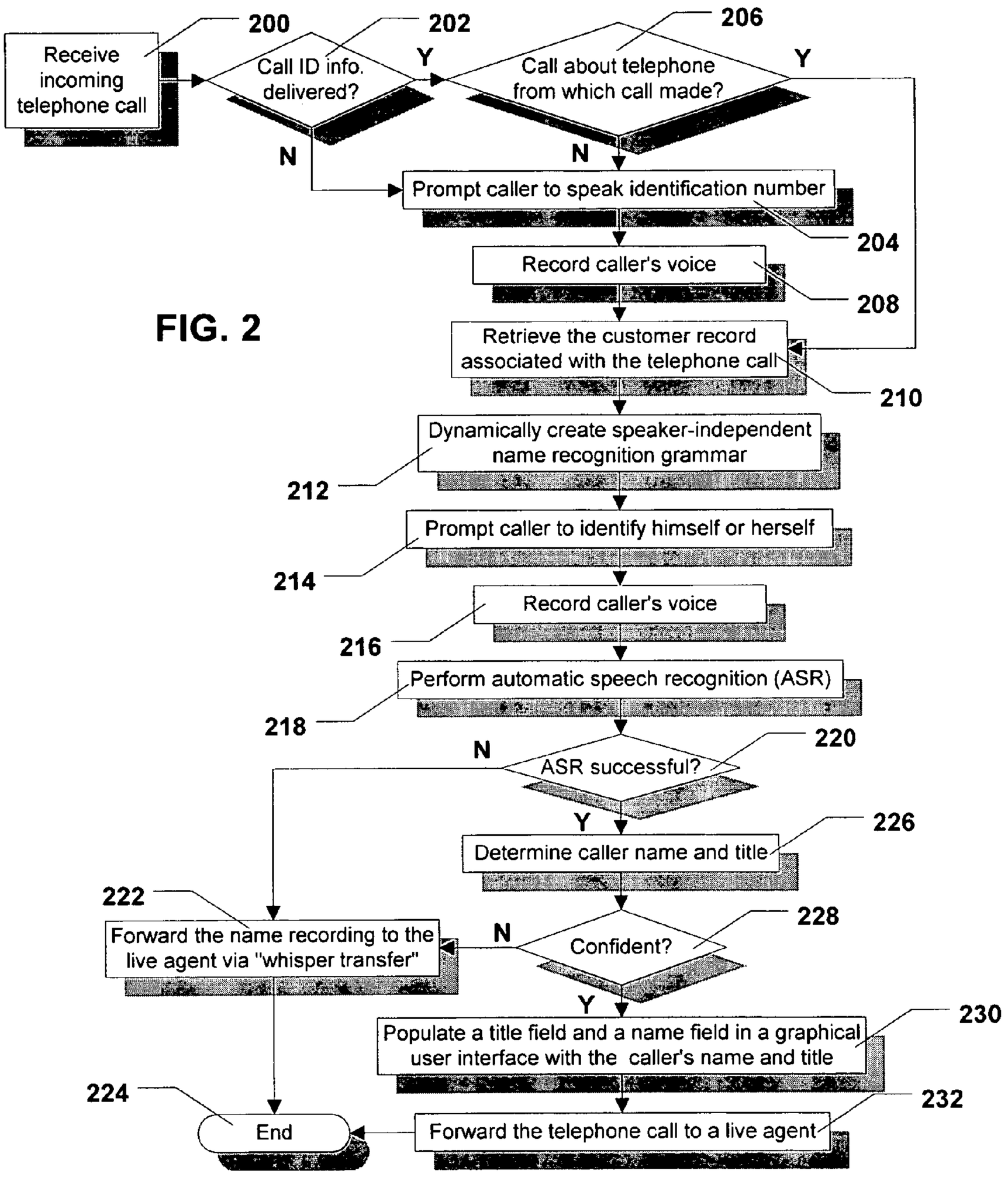

100
104
First Telephone
106
Second Telephone
PSTN/VoIP
102
108
110
IVR
120
First-name and Gender Matching Database
116
112
Automatic Caller Identification Module
118
Automatic Speech Recognition Module
122
Customer Service Database
Memory Device
114
Processor
Caller Identification System
Computer
124

FIG. 1

FIG. 2


Receive incoming telephone call
200
Call ID info. delivered?
202
Y
N
Call about telephone from which call made?
206
Y
N
Prompt caller to speak identification number
204
Record caller's voice
208
Retrieve the customer record associated with the telephone call
210
Dynamically create speaker-independent name recognition grammar
212
Prompt caller to identify himself or herself
214
Record caller's voice
216
Perform automatic speech recognition (ASR)
218
ASR successful?
220
N
Y
Determine caller name and title
226
Confident?
228
N
Y
Forward the name recording to the live agent via "whisper transfer"
222
Populate a title field and a name field in a graphical user interface with the caller's name and title
230
Forward the telephone call to a live agent
232
End
224

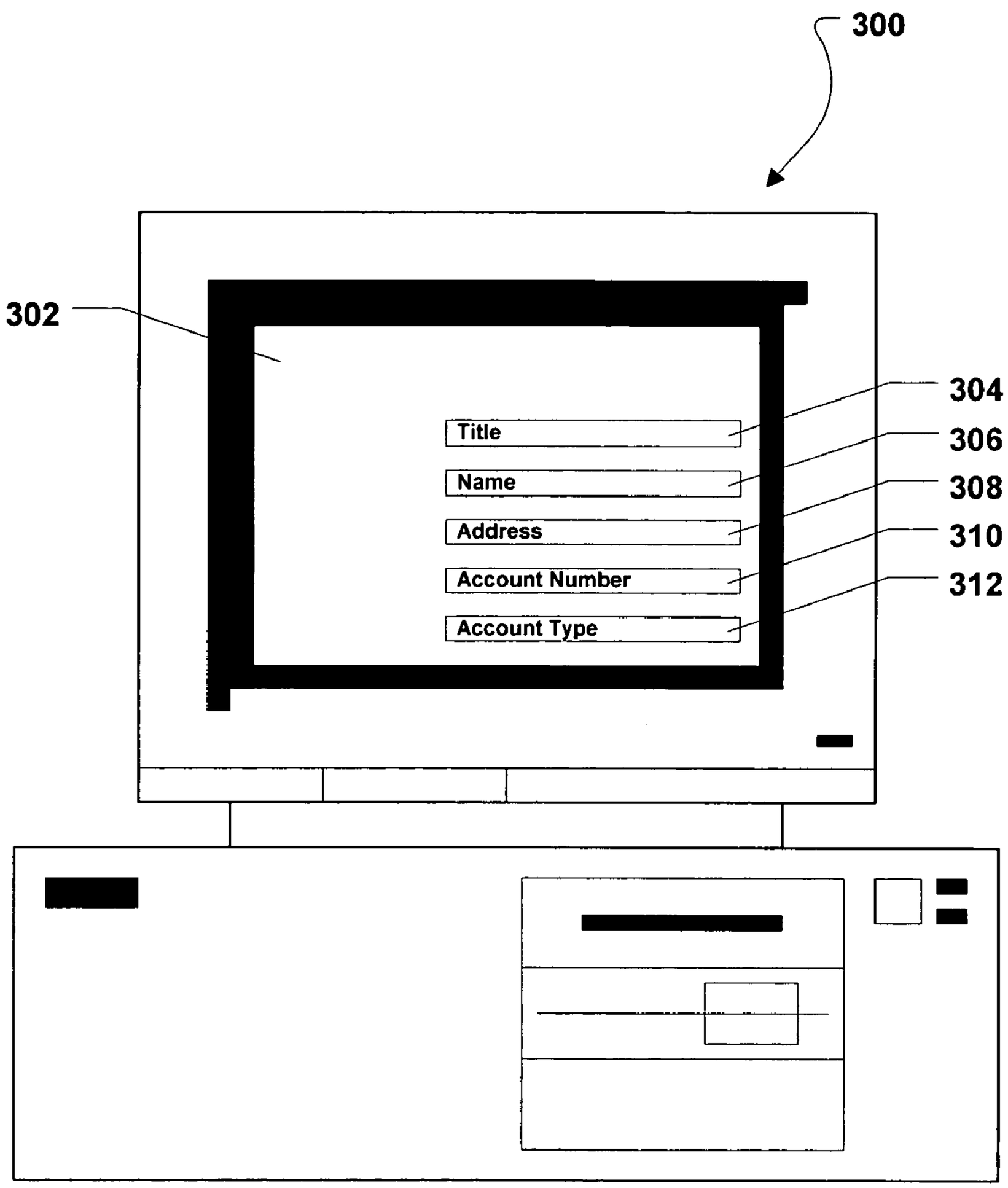

300
302
Title
Name
Address
Account Number
Account Type
304
306
308
310
312

FIG. 3

SYSTEM AND METHOD FOR IDENTIFYING TELEPHONE CALLERS

FIELD OF THE DISCLOSURE

The present disclosure relates generally to call center systems.

BACKGROUND

Telephone service providers of the public switched telephone network (PSTN) have been offering caller identification services that utilize the signaling system seven (SS7) protocol for many years. Since the early 1980's, various interactive voice response (IVR) technologies have been developed to use the caller identification function provided by SS7 to determine the originating line from which a telephone call was made. However, caller identification services only provide the telephone number from which the telephone call was initiated and the name(s) associated with the telephone number if the subscriber allows the telephone phone number to be listed. In order to determine who is calling, an IVR system or human customer service agent, must ask the caller to identify himself or herself.

Accordingly, there is a need for an improved system and method for identifying telephone callers.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is pointed out with particularity in the appended claims. However, other features are described in the following detailed description in conjunction with the accompanying drawings in which:

FIG. **1** is a general diagram of a telephone system;

FIG. **2** is a flow chart to illustrate a method for identifying telephone callers; and

FIG. **3** is a general diagram of a computer.

DETAILED DESCRIPTION OF THE DRAWINGS

A method of processing calls received at an interactive voice response (IVR) server is provided and includes receiving a telephone call at the IVR. Caller identity data that is associated with the telephone call is received and a customer profile that includes a list of individual names associated with the caller identity data is received. Each of the individual names is mapped to a speech recognition grammar pattern. Further, a caller of the telephone call is prompted to speak their name. A spoken name from the caller is received and recorded. Moreover, the spoken name is converted into a speech recognition grammar pattern. Thereafter, the speech recognition grammar pattern associated with the spoken name is compared to each of the speech recognition grammar patterns associated with the individual names retrieved from the customer profile.

In a particular embodiment, the caller identity data includes a telephone number. Also, in a particular embodiment, a caller name is identified based on a result of comparing the speech recognition grammar associated with the spoken name with each of the speech recognition grammar patterns associated with the individual names retrieved from the customer profile. Moreover, a title for the caller is determined based on the spoken name. In a particular embodiment, the title is determined based on a pitch of a voice of the caller and the pitch is derived from a recorded spoken name.

In still another particular embodiment, the method includes determining whether the probability that the title and the caller name are correct is above a predetermined threshold. The telephone call can be forwarded to a service agent terminal via a whisper transfer when the probability is below the predetermined threshold. In a particular embodiment, a name field can be automatically populated at a graphical user interface of an agent terminal with the caller name. Also, a title field can be automatically populated at the graphical user interface with the title of the caller. Additionally, the telephone call can be forwarded to a live customer service agent when the probability is above the predetermined threshold.

In another embodiment, a method of processing calls that are received at an interactive voice response (IVR) server is provided. Initially, a telephone call is received at the IVR and a caller is prompted to speak their name. Further, a spoken name is received from the caller. Based on the spoken name from the caller, a name of the caller is identified. Also, a title associated with the caller is determined.

In yet another embodiment, a system for identifying a telephone caller is provided. The system includes an interactive voice response server that includes a processor. A memory is accessible to the processor and a computer program is embedded within the memory. The computer program includes instructions to identify a name associated with a telephone caller in response to analyzing a recorded spoken name from the telephone caller. Additionally, the computer program includes instructions to determining a title associated with the caller based on the spoken name.

In still another embodiment, a graphical user interface of a customer service agent computer is provided. The graphical user interface includes a title field and the title field is automatically populated with a title of a telephone caller when a call is received at an interactive voice response server that is coupled to the customer service agent computer and forwarded to a customer service agent.

Referring initially to FIG. **1**, a telecommunications system is shown and is generally designated **100**. As shown, the system **100** includes a telecommunications network **102**. In a particular embodiment, the telecommunications network **102** is a public switched telephone network. In another embodiment, the telecommunications network **102** is a voice over Internet protocol (VoIP) network. As illustrated in FIG. **1**, a first telephone **104** and a second telephone **106** are coupled to the telecommunications network **102**. FIG. **1** also depicts a caller identification system **108** coupled to the telecommunications network **102**. The first telephone **104** and the second telephone **106** are for illustrative purposes and many more telephones can be coupled, or otherwise connected, to the telecommunications network **102**.

In a particular embodiment, as indicated in FIG. **1**, the caller identification system **108** includes an interactive voice response (IVR) server **110**. The IVR server **110** includes a memory device **112** and a processor **114** coupled to the memory device **112**. In an illustrative embodiment, the IVR server **110** also includes an automatic caller identification module **116** that is embedded within the memory device **112**. In a particular embodiment, the automatic caller identification module **116** can retrieve caller identification information related to calls received at the IVR server **110**. FIG. **1** further depicts an automatic speech recognition module **118** that is embedded within the memory device **112** in the IVR server **110**. The automatic speech recognition module **118** can be used to determine a caller's name and gender after a call is received at the IVR and after the caller is prompted to speak his or her name.

Still referring to FIG. **1**, a first-name and gender matching database **120** is coupled to the IVR **110**. In a particular embodiment, the first-name and gender matching database

120 includes information that can be used by the automatic speech recognition module **118** for determining the gender of a caller, e.g., based on the first name of the caller or the pitch of the caller's voice. FIG. **1** also shows a customer service database **122** that is coupled to the IVR **110**. Particularly, the customer service database **122** can include customer information such as, account information, customer address information, etc.

As depicted in FIG. **1**, a computer **124** can be coupled to the caller identification system **108**. In a particular embodiment, the computer **124** can be a customer service agent computer or a customer service agent terminal. Further, in a particular embodiment, many more computers **124** can be coupled to the caller identification system **108** than the single computer **124** illustrated in FIG. **1**.

Referring now to FIG. **2**, a flow chart to illustrate a method for identifying telephone callers is shown and commences at block **200**. At block **200**, an incoming telephone call is received. At decision step **202**, a determination is made as to whether caller identification information is delivered with the incoming telephone call. If caller identification information is not delivered with the incoming telephone call, the method moves to block **204** and the caller is prompted to speak an identification number. In a particular embodiment, the identification number can be a telephone number, an account number, a social security number, or any other number linked to a customer's account for identification purposes. From block **204**, the method can move to block **208**.

Returning to decision step **202**, if the caller identification information is delivered, the method continues to decision step **206**. At decision step **206**, a determination is made as to whether the present call is about the telephone number identified in the caller identification information. For example, the present call can be a service call concerning the identified telephone number and the present call can be made from the telephone or location associated with the identified telephone number. If the present call is not about the identified telephone number, the method continues to block **204** and the caller is prompted to speak an identification number. Next, at block **208**, the caller's voice is recorded. The method can then proceed to block **210**.

Returning to decision step **206**, if the call is about the identified telephone number, the method moves to block **210**. At block **210**, a customer record associated with the identified telephone number is retrieved. In a particular embodiment, the customer record can be retrieved from the customer service database **122** (FIG. **1**). Moving to block **212**, a speaker-independent name recognition grammar is dynamically created. In a particular embodiment, the name recognition grammar is a phonetic spelling of the user's name. Next, at block **214**, the caller is prompted to identify himself or herself. Further, at block **216**, the caller's voice is recorded while he or she is identifying himself or herself.

Continuing to block **218**, automatic speech recognition is performed on the recorded voice. In a particular embodiment, the automatic speech recognition is performed in the automatic speech recognition module **118** within the IVR server **110**. Further, in a particular embodiment, the automatic speech recognition module **118** measures the pitch of the speaker's voice in order to determine the gender of the speaker. Additionally, the automatic speech recognition module **118** attempts to recognize the spoken name by comparing the dynamically created name grammar to a table of names. In a particular embodiment, the table of names can be a comprehensive table of names. In another particular embodiment, the table of names corresponds to the names associated with a particular account, e.g., a husband name and a wife name. In a particular embodiment, the table of names can be a comprehensive table of names. In another particular embodiment, the table of names corresponds to the names associated with a particular account, e.g., a husband name and a wife name.

Moving to decision step **220**, a decision is made in order to determine whether the automatic speech recognition is performed successfully, i.e., whether the automatic speech recognition module recognizes the name spoken. If the automatic speech recognition is not performed successfully, the method moves to block **222** and the name recording is forwarded to a customer service agent via a "whisper transfer" so that the customer service agent can hear the name recording and greet the caller using the recorded name. In a particular embodiment, during the "whisper transfer," the caller is placed in hold and the IVR connects to an available customer service agent. Then, the recorded name is played to the customer service agent before the call is transferred to the customer service agent. The customer service agent can listen to the recorded name and compare it to a name in a name field, if present, to determine the appropriate greeting for the caller. The method then ends at state **224**.

At decision step **220**, if the automatic speech recognition is performed successfully, the method proceeds to block **226** and the caller's name and title is determined. In a particular embodiment, the spelling of the caller's name can be determined. Particularly, the name and title can be determined by comparing the text string corresponding to the recorded name, e.g., the dynamically created recognition grammar, to a list of names. Further, to determine a caller's title, a gender table including common first names is used to determine if a name recognized by the automatic speech recognition module is most likely associated with a male or female caller. If a match is found, the title information obtained from the gender table is assigned to the name. If an initial match is not found, pitch characteristics of the voice recording are used to attempt to determine the gender of the caller.

Moving to decision step **228**, a decision is made in order to determine whether the gender determination is accurate within a predetermine probability. If not, the method continues to block **222** and the telephone call is transferred to a customer service agent using a "whisper transfer." The customer service agent can compare the voice recording to the text of the name that appears in a GUI. The customer service agent can decide the gender of the caller and greet the caller appropriately. If the gender determination is deemed to be accurate above a certain probability, the method proceeds to block **230** and a name field and a title field in a GUI are automatically populated with the caller's name and title. Further, an address field, an account number field, and an account type field can be automatically populated. Moving to block **232**, the telephone call is forwarded to a live agent. Then, the method ends at state **224**.

Referring now to FIG. **3**, a computer configured to support a customer service agent is shown and is generally designated **300**. As illustrated in FIG. **3**, a GUI **302** can be displayed at the computer **300**. In a particular embodiment, the GUI **302** can include a title field **304**, a name field **306**, an address field **308**, an account number field **310**, and an account type field **312**. In a particular embodiment, the title field **304** and the name field **306** can be automatically populated, as described herein, in order to present a caller's name and title to a customer service agent using the computer **300**. The remaining fields **308**, **310**, **312** can be populated with information retrieved from the customer service database **122**.

With the configuration of structure described herein, the system and method provides a way for a customer service agent to appropriately greet a caller who is calling regarding

a particular telephone number. The telephone call may concern account information, repair information, and/or the addition of services to an account. Further, the system and method automates the task of asking a caller his or her name, eliminates the need for the customer agent to ask who is calling, and reduces the time that a customer agent service must spend on the phone with callers. Additionally, the system and method can provide improved accuracy for determining a user's name and gender.

For many types of services, e.g., local telephone service, long distance telephone services, Internet-based services, multiple users may initiate a customer service call at different times for the same account. In this type of scenario, the system and method described herein can determine who among the users associated with an account is calling and greet the caller appropriately.

The above-disclosed subject matter is to be considered illustrative, and not restrictive, and the appended claims are intended to cover all such modifications, enhancements, and other embodiments, which fall within the true spirit and scope of the present invention. Thus, to the maximum extent allowed by law, the scope of the present invention is to be determined by the broadest permissible interpretation of the following claims and their equivalents, and shall not be restricted or limited by the foregoing detailed description.

What is claimed is:

1. A method of processing calls received at an interactive voice response (IVR) server, the method comprising:

receiving a telephone call at the IVR server;

receiving caller identity data associated with the telephone call and receiving a text list of names of individuals associated with the caller identity data;

dynamically creating multiple name recognition grammar patterns by generating a phonetic spelling of each name in the text list of names of individuals associated with the caller identity data;

prompting a caller of the telephone call to speak a name associated with the caller;

receiving and recording a spoken name from the caller;

converting the spoken name into a speech recognition grammar pattern;

selectively comparing the speech recognition grammar pattern associated with the spoken name to the multiple name recognition grammar patterns;

determining a text string from the text list of names of individuals associated with the caller identity data corresponding to a name recognition grammar pattern that matches the speech recognition grammar pattern;

comparing the text string to entries in a table to determine a gender of the caller, the table including a plurality of first names and an associated indication that a particular first name indicates the caller is one of a male caller and a female caller;

assigning a title to the caller based on the gender of the caller when the text string matches an entry in the table; and

forwarding the telephone call and the title to a service agent terminal.

2. The method of claim **1**, wherein the caller identity data includes a telephone number.

3. The method of claim **1**, further comprising:

identifying a caller name at least partially based on a result of the selective comparison.

4. The method of claim **3**, further comprising determining whether a probability that the title and the caller name are correct is above a predetermined threshold.

5. The method of claim **4**, further comprising populating a name field at a graphical user interface of the service agent terminal with the caller name when the probability that the title and the caller name are correct is above the predetermined threshold.

6. The method of claim **5**, further comprising populating a title field at the graphical user interface with the title of the caller.

7. The method of claim **5**, further comprising forwarding the telephone call to a live customer service agent.

8. A method of processing calls received at an interactive voice response (IVR) server, the method comprising:

receiving a telephone call at the IVR server;

prompting a caller to speak a name associated with the caller;

receiving and recording a spoken name from the caller;

converting the spoken name into a speech recognition grammar pattern;

identifying a name of the caller based on a comparison between the speech recognition grammar pattern and at least one name recognition grammar pattern that is dynamically created by generating a phonetic spelling of a name in a text list of names of individuals associated with a telephone number from which the telephone call was initiated, the text list obtained from a customer service database;

determining a text string associated with the name of the caller from the text list;

comparing the text string to entries in a table to determine a gender of the caller, the table including a plurality of first names and an associated indication that a particular first name indicates the caller is one of a male caller and a female caller;

assigning a title to the caller based on the gender of the caller when the text string matches an entry in the table and displaying the title and the name of the caller on a service agent terminal; and

forwarding the telephone call, the name, and the title to the service agent terminal via a whisper transfer when a probability that the caller name is correct is determined to be below a predetermined threshold.

9. The method of claim **8**, wherein the text string corresponds to a spelling of the name associated with the caller.

10. The method of claim **9**, further comprising forwarding the telephone call to a customer service agent computer when the caller name is likely to be correct.

11. The method of claim **10**, further comprising populating a name field at a graphical user interface displayed at the customer service agent computer with the identified name of the caller.

12. The method of claim **10**, further comprising populating a title field at a graphical user interface displayed at the customer service agent computer with the title.

13. A system for identifying a telephone caller, the system comprising:

an interactive voice response server including a processor;

a memory accessible to the processor; and

a computer program embedded within the memory, the computer program comprising:

instructions to identify a name associated with a telephone caller by:

converting a recorded spoken name from the telephone caller into a speech recognition grammar pattern; and

comparing the speech recognition grammar paftem to at least one name recognition grammar pattern that is dynamically created by generating a phonetic

spelling of a name in a text list of names of individuals associated with a telephone number that initiated a received call, the text list obtained from a customer service database;

instructions to determine a title associated with the telephone caller by:

determining a text string associated with the name associated with the telephone caller from the text list;

comparing the text string to entries in a table to determine a gender of the telephone caller, the table including a plurality of first names and an associated indication that a particular first name indicates the caller is one of a male caller and a female caller; and

assigning the title to the telephone caller based on the gender of the telephone caller when the text string matches an entry in the table; and

instructions to forward the title and a telephone call associated with the telephone caller to a service agent terminal.

14. The system of claim **13**, wherein the text string corresponds to a spelling of the name associated with the telephone caller.

15. The system of claim **14**, further comprising a customer service agent computer coupled to the interactive voice response server.

16. The system of claim **13**, wherein the computer program further comprises instructions to forward the telephone call to a customer service agent computer.

17. The system of claim **16**, wherein the computer program further comprises instructions to automatically populate a name field at a graphical user interface displayed at the customer service agent computer with the name associated with the telephone caller, when a probability that the title and the name associated with the telephone caller are correct is above a predetermined threshold.

18. The system of claim **17**, wherein the computer program further comprises instructions to automatically populate a title field of a graphical user interface displayed at the customer service agent computer with the title.

19. The method of claim **1**, further comprising determining a title of the caller at least partially based on a pitch of a voice of the caller when the text string does not match any entry in the table, wherein the pitch is derived from a recording of the spoken name.

20. The method of claim **8**, further comprising determining a title of the caller at least partially based on a pitch of a voice of the caller when the text string does not match any entry in the table, wherein the pitch is derived from a recording of the spoken name.

21. The system of claim **13**, wherein the instructions further comprise instructions to determine the title associated with the telephone caller at least partially based on a pitch of a voice of the telephone caller when the text string does not match any entry in the table, wherein the pitch is derived from the recorded spoken name.

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